

PATENT SPECIFICATION

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(54) PAPERMAKERS FABRICS

(71) We, SCAPA PORRITT LIMITED, a British Company of Cartmell Road, Blackburn, Lancashire, BB2 2SZ, do hereby declare the invention, for which we pray that a Patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention concerns papermakers fabrics.

In the papermaking process, a liquid suspension of cellulosic fibres is applied to a moving openwork mesh through which excess liquid is drained to give a moist web of cellulosic fibres and such filler or other materials as are appropriate to the paper being produced, the web subsequently passing through a roller nip whereat further liquid is removed, and eventually passing over heated rollers whereat the paper is dried.

The openwork mesh originally comprised a woven metal mesh, particularly phosphor bronze, but for some years past synthetic materials have been used and 'wires' of synthetic textile material are now commonplace.

One problem met with in connection with all woven wires has been the necessity to provide such wires in an endless belt form on the papermaking machine, this requiring that the wire be woven endless and applied to the machine in such form or that the wire be woven flat and the end joined before or after application to the machine.

The present invention is directed to flat-woven wires, and is particularly concerned with a wire which can be easily joined after its mounting into the paper machine.

The formation of a seam by weaving the warp yarns, that is to say the machine direction yarns in the eventual fabric, back into the cloth thereby leaving a series of loops at either end of the fabric is well known. One major problem which has been found in practice with using a warp loop seam is that, as it is subjected to abrasion in use, the loops quickly disintegrate and the effective life of the fabric is correspondingly shortened.

It is an object of this invention to produce a fabric in which the problem of abrasion or seam failure is of reduced proportions, and thus, in accordance with the invention there is proposed a flat-woven papermaker's fabric comprising at least one layer of cross-machine direction weft yarns interwoven with machine direction warp yarns to provide a base weave structure, characterised by additional cross-machine direction yarns at least on one face of the base weave structure and at least in the region of the fabric ends, the said additional cross-machine direction yarns lying or extending outwardly of the plane of the base weave structure at the said one face and floating at said face in relation to the said base weave structure, being bound to the base weave structure by warp yarns of such structure.

The invention will now be described further, by way of example only, with reference to the accompanying drawings in which:—

Fig. 1 is a transverse cross-section taken through a papermaker's fabric embodying the invention;

Fig. 2 is a longitudinal sectional view of an end region of a papermaker's fabric constructed in accordance with the invention and showing a single, loop-forming yarn;

Fig. 3 is a weave peg plan for the fabric of Figs. 1 and 2; and

Figs. 4a to 4i are diagrams illustrating the paths of the individual warp yarns of a repeat, in accordance with the peg plan of Fig. 3.

Referring now to the drawings, and particularly to Figs. 1 and 2 thereof, a flat-woven papermakers fabric of known duplex or semi-duplex weave structure comprising warp yarns 21 and weft yarns 22 and having warp loops 23 extending from the ends thereof whereby such ends might be joined together to form a seam further includes additional weft yarns 24 at one or other face of the fabric, such yarns 24 floating at the surface of the fabric and being woven with, say, every twelfth warp yarn, and, in the

embodiment illustrated, being provided on the basis of one additional weft yarn for each weft yarn ordinarily present in the structure. The additional weft yarns 24 will generally be provided throughout the full longitudinal extent of the fabric and will ordinarily be selected, as to their characteristics, to reduce wear during use of the fabric on a papermaking machine. However, it may be found sufficient, as regards protecting the region of the seam against wear, to provide additional weft yarns only in the region of the fabric ends, the extreme additional weft yarn in either case, being closely adjacent to such ends. The yarns 24 will preferably have, for example, an inherent high wear-resistance or an anti-slip characteristic, although such characteristics may be derived from a suitable resin or other treatment to which the yarn is subjected. It is not necessary, however, that the additional weft yarns have a wear-resistance beyond that of the other yarns of the fabric since the invention relies upon the fact that, whereas when a warp loop seam is made on the end of the fabric the warp loops lie substantially in the same plane as the body of the fabric, the provision of additional weft yarns as herein proposed will result in the backs of the loops being in a plane A displaced inwardly of the total fabric in relation to the plane B of the back of such total fabric, the seam thereby being protected by the additional weft yarns, and particularly by the mass of such additional weft yarns.

The additional weft yarns will ordinarily be of a diameter (or equivalent) not greater than that of the weft yarns ordinarily present in the fabric, and may comprise yarns conventionally used in the art. Thus, resin coated monofilament or multifilament synthetic yarns, uncoated such yarns, glass yarns or metal yarns may be utilised.

A typical fabric structure is shown in Figs. 3 and 4, Fig. 3 being a weave peg-plan showing the shedding of the warp yarns for a pattern repeat of the total structure widthwise of the fabric of twelve ends and lengthwise of the fabric of sixteen picks and Figs. 4a to 4l showing the relationship between the individual ones of the warp yarns 1 to 12 of the peg-plan of Fig. 3 and the individual weft yarns 1 to 16 of such peg-plan.

Thus, as can be seen from the right hand column of the peg-plan and from Fig. 4a warp yarn 1 is lifted for picks 1 to 3, is lowered for pick 4, raised again for pick 5, lowered for picks 6 to 12, raised for pick 13 and then lowered for picks 14 to 16, the yarn then being raised for picks 1 to 3 of the next repeat.

Similarly, the peg-plan and Figs. 4b show that warp yarn 2 is lifted for the insertion of

weft yarn 1, lowered for picks 2 to 4, raised again for picks 5 and 6, lowered for picks 7 and 8, raised for pick 9, and then lowered for picks 10 to 16 before being raised again for pick 1 of the next repeat.

The paths of warp yarns 3 to 12 are shown in the relevant columns of the peg plan of Fig. 3 and in Figs. 4c to 4l respectively.

Reference to Fig. 3 will show that each of the additional weft yarns, which yarns comprise wefts 3, 4, 7, 8, 11, 12, 15 and 16 of the peg-plan, binds with the fabric as formed by the warp yarns 1 to 12 and the remaining weft yarns only once in each three pattern repeats of the base weave in the weftwise direction of the fabric.

It can be clearly seen from figures 1 and 2 of the drawings how the plane of the cross machine direction yarns, as constituted by the additional weft yarns, lies substantially outside that of the machine direction loops forming the seam.

The invention is not restricted to the exact features of the embodiment herein described and illustrated, since alternatives will readily present themselves to one skilled in the art. Thus whilst it is found preferably to provide additional weft yarns in like numbers in relation to the weft yarns ordinarily present, a lesser density of such additional weft yarns may be found satisfactory in some circumstances, although a ratio of additional weft yarns to weft yarns ordinarily present of less than 1 to 2 is thought unlikely to provide a substantial improvement in wear resistance. The extent to which the additional weft yarns float at the fabric surface may vary to suit particular circumstances, but ideally the additional weft yarns float over three repeats of the base weave, although arrangements wherein the float is over two or more than three such repeats are satisfactory.

The invention is applicable both to forming fabrics and to dryer fabrics, and may be used in the context of both single layer and multi-layer fabrics.

In the case of a papermakers fabric for use as a paper machine wire or a forming fabric (which expressions are, in this specification, to be considered to be synonymous), the additional weft yarns will be provided at the intended roller side of the fabric, whereas, bearing in mind that advantage has been found to stem from the provision of additional weft yarns at the paper side of a dryer fabric in that a better paper-forming surface is obtained by so doing, in the case of dryer fabrics the additional weft yarns will ordinarily be provided at such paper side and will preferably comprise spun yarns. The invention does, however, so extend as to include structures wherein additional weft

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yarns are provided at each face of the fabric.

Although the specific weave structure herein illustrated is of particular application in the context of the invention, the invention is not limited to base weaves comprising a three in one twill, and other base weaves may be utilised, if preferred.

WHAT WE CLAIM IS:—

10 1. A flat-woven papermaker's fabric comprising at least one layer of cross-machine direction weft yarns interwoven with machine direction warp yarns to provide a base weave structure, characterised by additional cross-machine direction yarns at least on one face of the base weave structure and at least in the region of the fabric ends, the said additional cross-machine direction yarns lying or extending outwardly of the plane of the base weave structure at the said one face and floating at said face in relation to the said base weave structure, being bound to the base weave structure by warp yarns of such structure.

25 2. A papermaker's fabric as claimed in claim 1, wherein selected ones of the machine direction warp yarns define outwardly extending loops at the ends of the base weave structure.

30 3. A papermaker's fabric as claimed in claim 1 or 2, wherein the said additional cross-machine direction weft yarns are provided throughout the full longitudinal extent of the fabric.

40 4. A papermaker's fabric as claimed in any one of the preceding claims, wherein the additional cross-machine direction weft yarns float at the face of the fabric over three repeats of the base weave structure.

45 5. A papermaker's fabric as claimed in claim 1 having a base weave structure comprised of first and second sets of cross-machine direction weft yarns interwoven with a common set of machine direction warp yarns, the individual ones of said additional cross-machine direction weft yarns floating in relation to the base weave structure and being held in position thereon, the ratio of the total number of machine direction warp yarns across which a given additional cross-machine direction weft yarn extends to the number of points at which said given cross-machine direction weft yarn is held in position on the base weave structure being not less than 4:1.

6. A papermakers' fabric as claimed in any one of the preceding claims, wherein the

diameter, or equivalent, of the additional cross-machine direction weft yarns, does not exceed that of the cross-machine direction weft yarns of the base weave structure.

7. A papermaker's fabric as claimed in any one of the preceding claims, wherein the additional cross-machine direction weft yarns are provided in equal numbers relative to the cross-machine direction yarns of the base weave structure.

8. A papermaker's fabric as claimed in any one of claims 1 to 6, wherein the additional cross-machine direction weft yarns are provided on the basis of one additional weft yarn for each two cross-machine direction weft yarns of the base weave structure.

9. A papermaker's fabric as claimed in any one of the preceding claims, wherein the additional cross-machine direction weft yarns are provided at a location directly adjacent to the fabric ends.

10. A papermaker's fabric as claimed in any one of the preceding claims, wherein the additional cross-machine direction weft yarns define a plane spaced outwardly of the fabric in relation to the plane of the adjacent surface of the base weave structure.

11. A papermaker's fabric as claimed in any one of the preceding claims, comprising a forming fabric and wherein the additional cross-machine direction weft yarns are provided at the intended roller side of the fabric.

12. A papermaker's fabric as claimed in any one of the preceding claims 1 to 10, comprising a dryer fabric and wherein the additional cross-machine direction weft yarns are provided at the intended paper side of the fabric.

13. A papermaker's dryer fabric as claimed in claim 12, wherein the additional cross-machine direction weft yarns are spun yarns.

14. A papermaker's fabric as claimed in any one of the preceding claims, wherein additional cross-machine directions yarns are provided at each face of the base weave structure.

15. A papermaker's fabric as claimed in any one of the preceding claims, wherein the base weave structure comprises a semi-duplex fabric weave.

16. A papermaker's fabric as claimed in claim 15, wherein the base weave structure comprises a 3 and 1 twill.

17. A papermaker's fabric as claimed in any one of the preceding claims, wherein

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the additional cross-machine direction weft yarns comprise synthetic yarns.

- 5 18. A papermaker's fabric substantially as hereinbefore described with reference to and as illustrated in the various figures of the accompanying drawings.

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